

Florida Department of Education
CURRICULUM FRAMEWORK

Program Title: ENGINEERING RELATED TECHNOLOGY
Program Type: Job Preparatory
Occupational Area: Industrial Education
Components: One Program with One Occupational Completion Point

PSAV

Program Number I159999
CIP Number 0615.999900
Grade Level 30, 31
Standard Length 450 hours
Certification ANY INDUS ED G
 ANY TECHNICAL ED G
Facility Code 244
Co-op Method Yes
Apprenticeship No
CSO SkillsUSA, Inc.
Basic Skills
 Math 10
 Language 10
 Reading 10

- I. **MAJOR CONCEPTS/CONTENT:** The purpose of this program is to prepare individuals for advanced training that may result in employment as Mechanical Engineering Technicians (OES 22511) (SOC 17-3027), and Mechanical Equipment Engineering Assistants (DOT 007.161-018) (SOC 17-2141).

The course content will include the following: engineering related general education skills (English, mathematics, physics); tools, machinery, and drafting skills; familiarity with working drawings and blueprints; technical recording and reporting; and other engineering related skills to provide a broad base of knowledge which will support advanced training in specialty areas.

The course content should also include training in communication; leadership; human relations and employability skills; and safe, efficient work practices.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Engineering industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

- II. **LABORATORY ACTIVITIES:** Shop or laboratory activities are an integral part of this program. These activities provide instruction in the use of tools, equipment, materials and processes found in the industry. Students are also instructed in the following: recording and reporting of engineering data; the application of problem solving techniques and mathematically-derived solutions to engineering problems or projects; production of engineering drawings and working drawings; the preparation of bills of materials from engineering or shop drawings; the application of appropriate engineering codes and specifications; the preparation of

data or laboratory logbooks; the application of principles of physics, and practical experience in the application of safety principles and procedures.

III. SPECIAL NOTES: SkillsUSA, Inc. is the appropriate Career Student Organization (CSO) for providing leadership training and for reinforcing specific career and technical skills. CSOs, when provided, shall be an integral part of the career and technical instructional program, and the activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative training - OJT is appropriate for this program. Whenever cooperative training - OJT is offered, the following are required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a workstation that reflects equipment, skills and tasks that are relevant to the occupation which the student has chosen as a career goal. The student must receive compensation for work performed.

If this program is offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic-skills grade levels required for postsecondary adult vocational students to complete this program are: Mathematics 10.0, Language 10.0, Reading 10.0. These grade-level numbers correspond to grade-equivalent scores obtained on one of the state-designated basic-skills examinations. If a student does not meet the basic-skills level required for completion of the program, remediation should be provided concurrently through Vocational Preparatory Instruction (VPI). Please refer to the Rule for exemptions.

To be transferable statewide between institutions, this program/course must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific program or course articulation agreements with each other.

When this program is offered at the postsecondary level, it may be offered in courses. Vocational credit shall be awarded to the student on a transcript in accordance with Section 1001.44, F.S.

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Adult students with disabilities must self-identify and request such services. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

SCANS Competencies: Instructional strategies for this program must include methods that require students to identify, organize, and use resources appropriately; to work with each other cooperatively and productively; to acquire and use information; to understand social, organizational, and technological systems; and to work with a variety of tools and equipment. Instructional strategies must also incorporate the methods to improve students' personal qualities and high-order thinking skills.

IV. **INTENDED OUTCOMES:** After successfully completing the program, the student will be able to:

OCCUPATIONAL COMPLETION POINT - DATA CODE A (450 Hours)

Mechanical Engineering Technician - OES 22511, SOC 17-3027

Mechanical Equipment Engineering Assistants - DOT 007.161-018, SOC 17-2141

- 01.0 Demonstrate engineering related English skills.
- 02.0 Apply engineering related mathematical concepts and perform engineering related calculations.
- 03.0 Demonstrate engineering related applied physics skills.
- 04.0 Apply and use safety rules and standards.
- 05.0 Apply engineering related shop or laboratory skills.
- 06.0 Demonstrate knowledge and use of engineering related tools, machinery and equipment.
- 07.0 Apply engineering related basic drafting skills.
- 08.0 Demonstrate a basic knowledge of engineering related working drawings.
- 09.0 Demonstrate engineering related computer assisted drafting skills.
- 10.0 Demonstrate proficiency in engineering related technical recording and reporting.
- 11.0 Demonstrate and apply knowledge of miscellaneous engineering related skills.
- 12.0 Demonstrate employability skills.
- 13.0 Demonstrate understanding of entrepreneurship.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Program Title: Engineering Related Technology
Postsecondary Number: I159999

OCCUPATIONAL COMPLETION POINT - DATA CODE A (450 Hours)

Mechanical Engineering Technician - OES 22511, SOC 17-3027
Mechanical Equipment Engineering Assistants - DOT 007.161-018, SOC 17-2141

01.0 DEMONSTRATE ENGINEERING RELATED ENGLISH SKILLS--The student will be able to:

- 01.01 Identify and define frequently used engineering related terms.
- 01.02 Determine the main idea of engineering related memos and instructions.
- 01.03 Identify and list the order of events in a set of engineering specifications.
- 01.04 Write a statement of how to follow a given set of written instructions.
- 01.05 Obtain appropriate engineering related information from pictures, maps or signs.
- 01.06 Demonstrate basic engineering related English writing skills.
- 01.07 Write an engineering related request for personnel, materials or supplies, information, notation of assignment and change order.
- 01.08 Write a clear, concise and sequenced series of brief statements describing the steps of an engineering related process or event.
- 01.09 Use a proper form when writing a simple engineering related business letter and addressing an envelope for it.
- 01.10 Write an engineering related letter of request, adjustment, complain, application or opinion which contains necessary and accurate information.
- 01.11 Proofread engineering related reports for spelling.
- 01.12 Write an engineering related memorandum using a proper format.

02.0 APPLY ENGINEERING RELATED MATHEMATICAL CONCEPTS AND PERFORM ENGINEERING RELATED CALCULATIONS--The student will be able to:

- 02.01 Solve basic mathematics problems.
- 02.02 Solve basic algebraic problems.
- 02.03 Solve basic geometric problems.
- 02.04 Solve basic trigonometric problems.
- 02.05 Define physical constant as used in mathematical equations.
- 02.06 Define mathematical constant as used in mathematical equations.
- 02.07 Define independent variable as used in mathematical equations.
- 02.08 Define dependent variable as used in mathematical equations.
- 02.09 Write the basic mathematical formula stating the relationship of force, pressure and area.
- 02.10 Write the basic mathematical formula stating the relationship of weight, mass and acceleration of gravity.
- 02.11 Write the basic mathematical formula stating the relationship of voltage, current and electrical resistance.
- 02.12 Distinguish between fundamental and derived units and give examples of each from the International System of units (SI) and English units.
- 02.13 Explain the terms "dimensionless quantity" and "radian".

- 02.14 Name the seven basic SI units and give the symbol and quantity measured for each.
- 02.15 Name the two supplementary SI units and give the symbol and quantity measured for each.
- 02.16 List the derived SI unit and its symbol for frequency.
- 02.17 Write, in the accepted notation, expressions indicating the products, quotients and reciprocals of given SI units.
- 02.18 Convert lengths in feet and inches to the equivalent length in SI units.
- 02.19 Calculate a weight in pounds, given a mass in kilograms.
- 02.20 Identify the term angle.
- 02.21 Apply the Pythagorean Theorem to determine the third side of a triangle when given a right triangle with two known sides.
- 02.22 Add and subtract two or more given vector quantities graphically, with the aid of a scale and protractor.
- 02.23 Resolve a vector graphically, given the vector quantity with magnitude and direction specified and with the aid of a scale and protractor.
- 02.24 Draw a technically acceptable graph from a table of experimental data suitable for plotting on rectangular-coordinate graph paper.
- 02.25 Write a given decimal number in scientific notation.
- 02.26 Write a number given in scientific notation in decimal form.
- 02.27 Multiply and divide numbers and solve equations using the three theorems of logarithms for products and quotients.
- 02.28 Measure linear dimensions with a vernier caliper to the nearest 0.1-mm and with a micrometer caliper to the nearest 0.001-mm.

03.0 DEMONSTRATE ENGINEERING RELATED APPLIED PHYSICS SKILLS--The student will be able to:

- 03.01 Demonstrate applied skills in mechanics.
- 03.02 Apply and solve vectors.
- 03.03 Solve force and motion problems.
- 03.04 Solve work, energy and power problems.
- 03.05 Solve friction problems.
- 03.06 Solve circular motion problems.
- 03.07 Solve rotational motion problems.
- 03.08 Solve problems involving the properties of solids.
- 03.09 Solve problems involving the properties of liquids.
- 03.10 Solve problems involving the properties of gases.
- 03.11 Demonstrate applied skills in heat, light and sound.
- 03.12 Solve temperature and heat problems.
- 03.13 Solve change-of-state problems.
- 03.14 Solve heat transfer problems.
- 03.15 Solve thermodynamic problems.
- 03.16 Solve refrigeration and air conditioning problems.
- 03.17 Solve harmonic motion problems.
- 03.18 Solve sound wave problems.
- 03.19 Solve light problems.
- 03.20 Solve optical problems.
- 03.21 Demonstrate applied skills in electricity and magnetism.
- 03.22 Solve electric circuit problems.
- 03.23 Solve electromagnetic problems.
- 03.24 Solve alternating current problems.
- 03.25 Solve generator and motor problems.
- 03.26 Solve electrostatic problems.
- 03.27 Solve magnetism problems.
- 03.28 Apply knowledge of strengths of materials.
- 03.29 Solve equilibrium problems.
- 03.30 Solve stress and strain problems.

- 03.31 Solve centroid and inertia problems.
- 03.32 Solve connection and joint problems.
- 03.33 Solve problems with beam stresses.
- 03.34 Solve torsion problems.
- 03.35 Solve compression problems.
- 03.36 Solve tension problems.
- 03.37 Solve force combination problems.

04.0 APPLY AND USE SAFETY RULES AND STANDARDS--The student will be able to:

- 04.01 Demonstrate knowledge and use of general safety rules.
- 04.02 Apply general shop or laboratory safety rules and procedures.
- 04.03 Demonstrate the operation of shop safety devices.
- 04.04 Apply fire safety rules and procedures.
- 04.05 Apply rules and procedures for electrical safety.
- 04.06 Apply safety rules and procedures for installing or using control panels or other electromechanical or electronic devices.
- 04.07 Apply safety rules and procedures applicable to stationary or moving machinery and the use and maintenance of machine safety guards.
- 04.08 Apply safety rules and procedures applicable to the use of moving transports (forklifts, conveyors, small electric trucks and flatbeds, etc.) and those to be followed where such transport is being operated.
- 04.09 Apply safety rules and procedures to be followed when operating or using hoists, cranes, elevators and other lifting equipment.
- 04.10 Apply safety rules and procedures to be follow when constructing or using scaffolding.
- 04.11 Demonstrate safety procedures to be followed in areas where heavy equipment (earth haulers, dump trucks, cranes, scrapers, bulldozers, various heavy trucks, etc.) is being operated.
- 04.12 Identify safety headgear and where, how and why it is to be used.
- 04.13 Identify safety straps and belts and where, how and why they are to be used.
- 04.14 Identify safety clothing (gloves, nets, aprons, goggles, soft-soled shoes or caulked boots, etc.) and where, how and why it is to be used.
- 04.15 Determine and demonstrate how to apply the Occupational Safety Health Administration (OSHA) regulations regarding manufacturing enclosures and machinery.

05.0 APPLY ENGINEERING RELATED SHOP OR LABORATORY SKILLS--The student will be able to:

- 05.01 Apply appropriate reading and writing skills in the writing and preparation of shop or laboratory reports or logbooks and in the technical recording and reporting of shop or laboratory data.
- 05.02 Apply appropriate mathematical concepts and calculations to solve given shop or laboratory projects or assignments.
- 05.03 Apply appropriate physics concepts and calculations in the solution of given shop or laboratory projects or assignments.
- 05.04 Apply appropriate safety rules, regulations and procedures in a shop or laboratory setting.
- 05.05 Apply basic drafting skills to the solution of engineering related problems or the accumulation and presentation of engineering data in a ship or laboratory setting.
- 05.06 Apply knowledge of working drawings to produce usable shop or laboratory drawings for various engineering fields and to draw off representative bills of materials from given working drawings.

- 05.07 Demonstrate the ability to research, locate and apply the appropriate codes to given engineering problems when presented in a shop or laboratory situation.
- 06.0 DEMONSTRATE KNOWLEDGE AND USE OF ENGINEERING RELATED TOOLS, MACHINERY, AND EQUIPMENT--The student will be able to:
- 06.01 Identify and explain the use of the hand tools used in the construction industries (carpentry, masonry, plumbing, welding, wiring, etc.).
 - 06.02 Identify and explain the use of the smaller power tools used in the construction industries (carpentry, masonry, plumbing, welding, wiring, etc.).
 - 06.03 Identify and explain the use of the larger tools and machinery used in the construction industries (carpentry, masonry, plumbing, welding, wiring, etc.).
 - 06.04 Identify and explain the use of the heavy machinery and equipment used in the construction industries (carpentry, masonry, plumbing, welding, wiring, etc.).
- 07.0 APPLY ENGINEERING RELATED BASIC DRAFTING SKILLS--The student will be able to:
- 07.01 Use basic drafting tools and equipment.
 - 07.02 Demonstrate the proper use and care of drawing equipment.
 - 07.03 Select proper drawing instruments to complement the drafting media (Mylar, vellum, etc.).
 - 07.04 Select correct pencils or pens to draw proper line weights.
 - 07.05 Use reproduction techniques and materials to construct a tracing.
 - 07.06 Produce sepia, blue-line, Mylar and electrostatic copies.
 - 07.07 Make Diazo (Ozalid) copies of original drawings.
 - 07.08 Set up a drafting machine and drafting equipment.
 - 07.09 Construct borders, information blocks and center drawings.
 - 07.10 Construct freehand sketches.
 - 07.11 Read and transfer measurements.
 - 07.12 Letter freehand (letters and numerals).
 - 07.13 Draw intersections of lines and planes.
 - 07.14 Letter with mechanical lettering devices and templates.
 - 07.15 Apply established drafting standards.
 - 07.16 Construct regular polygons and ellipses.
 - 07.17 Draw tangents to arcs, lines and circles.
 - 07.18 Construct involutes.
 - 07.19 Draw intersections of solids.
 - 07.20 Prepare a simple orthographic drawing.
 - 07.21 Identify the use and application of orthographic drawings.
 - 07.22 Draw simple auxiliary views or revolutions.
 - 07.23 Draw simple sectional views or conventions.
 - 07.24 Identify the symbols used to represent different materials.
 - 07.25 Apply dimensioning practices and techniques to drawings.
 - 07.26 Construct the lines used to dimension drawings.
 - 07.27 Identify the use and application of dimensioning practices.
 - 07.28 Apply conventional tolerances.
 - 07.29 Read and convert measurements.
 - 07.30 Construct simple pictorial drawings.
 - 07.31 Construct simple isometric drawings.
 - 07.32 Construct simple oblique drawings.
 - 07.33 Identify the use and application of pictorial drawings.
 - 07.34 Construct a simple perspective drawing.
 - 07.35 Construct several types of simple graphic charts.
 - 07.36 Identify the use and application of graphic charts.

08.0 DEMONSTRATE A BASIC KNOWLEDGE OF ENGINEERING RELATED WORKING DRAWINGS--
The student will be able to:

- 08.01 Construct drafting symbols.
- 08.02 Produce simple representative engineering drawings.
- 08.03 Draw off and prepare bills of materials.

09.0 DEMONSTRATE ENGINEERING RELATED COMPUTER ASSISTED DRAFTING SKILLS--The student will be able to:

- 09.01 Operate computer assisted drafting (CAD) equipment and peripherals.
- 09.02 Demonstrate data base management skills.
- 09.03 Perform applied CAD basic drafting skills.
- 09.04 Generate simple isometric views.
- 09.05 Generate simple assemblies, details and schematics.
- 09.06 Apply notes and special instructions.
- 09.07 Manipulate views.
- 09.08 Apply scaling.
- 09.09 Apply dimensioning.
- 09.10 Develop simple three-dimensional drawings.
- 09.11 Select appropriate line weight.
- 09.12 Generate simple layouts.
- 09.13 Demonstrate data processing management skills.
- 09.14 Develop execute lists using command language.
- 09.15 Write a simple FORTRAN program.
- 09.16 Interpret printed output.
- 09.17 Demonstrate post-processing file management skills.

10.0 DEMONSTRATE PROFICIENCY IN ENGINEERING RELATED TECHNICAL RECORDING AND REPORTING--The student will be able to:

- 10.01 Create and interpret schematics.
- 10.02 Record data and design curves and graphs.
- 10.03 Write reports and make oral presentations.
- 10.04 Maintain test and engineering data logs.
- 10.05 Make equipment failure reports.
- 10.06 Specify and requisition simple parts and supplies.
- 10.07 Compose technical letters and memoranda.
- 10.08 Write formal reports of laboratory experiences.
- 10.09 Draft preventive maintenance and calibration procedures.

11.0 DEMONSTRATE AND APPLY KNOWLEDGE OF MISCELLANEOUS ENGINEERING RELATED SKILLS--The student will be able to:

- 11.01 Demonstrate knowledge and use of practical geology and soils.
- 11.02 Apply the ability to create engineering related program education and review technique (PERT) charts to the scheduling of a simple hypothetical engineering project.
- 11.03 Apply the ability to create engineering related critical path method (CPM) charts to the scheduling of a simple hypothetical engineering project.
- 11.04 Apply the ability to create engineering related Gantt charts or lists to the scheduling of a simple hypothetical engineering project.
- 11.05 Demonstrate knowledge and use of slide rules, calculators and other general engineering related tools.
- 11.06 Demonstrate knowledge and use of engineering related reference materials.

- 11.07 Demonstrate the ability to read and interpret engineering related blueprints.
 - 11.08 Demonstrate knowledge and ability in engineering related problem solving.
 - 11.09 Demonstrate knowledge and use of engineering related trade terms and terminology.
- 12.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:
- 12.01 Conduct a job search.
 - 12.02 Secure information about a job.
 - 12.03 Identify documents that may be required when applying for a job.
 - 12.04 Complete a job application form correctly.
 - 12.05 Demonstrate competence in job interview techniques.
 - 12.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons.
 - 12.07 Identify acceptable work habits.
 - 12.08 Demonstrate knowledge of how to make job changes appropriately.
 - 12.09 Demonstrate acceptable employee health habits.
 - 12.10 Demonstrate knowledge of the "Florida Right-to-Know Law" as recorded in Florida Statutes Chapter 442.
- 13.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:
- 13.01 Define entrepreneurship.
 - 13.02 Describe the importance of entrepreneurship to the American economy.
 - 13.03 List the advantages and disadvantages of business ownership.
 - 13.04 Identify the risks involved in ownership of a business.
 - 13.05 Identify the necessary personal characteristics of a successful entrepreneur.
 - 13.06 Identify the business skills needed to operate a small business efficiently and effectively.